TEACHERS' RETIREMENT BOARD

INVESTMENT COMMITTEE

SUBJECT: Capital Market Assumptions Recommendation ITEM NUMBER: 8

ATTACHMENTS: 6

ACTION: X DATE OF MEETING: December 4, 2002

INFORMATION: ___ PRESENTER: Christopher Ailman

EXECUTIVE SUMMARY:

Staff recommends the Committee adopt the enclosed recommendation labeled **Attachment 1** as the CalSTRS long-term capital market assumptions. These will be revise the existing assumptions in the CalSTRS Investment Policy and Management Plan, and serve as key inputs into the stochastic asset – liability study being conducted by Milliman U.S.A.

Background:

At the November 6, 2002 meeting, the Investment Committee requested a review of the CalSTRS capital market assumptions before they are incorporated into the stochastic asset liability model. The Investment Committee adopted the current assumptions in July of 2001 for the last asset allocation review. To facilitate the review, staff has requested the current assumptions from each of our three general consultants. In addition, staff garnered assumptions used by other consultants and other large State pension plans. These are included in the matrix for comparison purposes. Overall the real rate of return, the return above the assumed inflation rate, and the spread between the various asset classes is very close. This is not unexpected since most of the assumptions are built off the historical averages for each asset class. The key driver of the divergence is the starting inflation assumptions and the time frame being forecasted.

Capital market assumptions are professional guesstimates about future investment returns, volatility, and correlations among the asset classes. Since no one can truly foretell future returns, we look to history of the financial markets to build reasonable expectations about the future results. History books provide some very interesting insights, namely, a study published in 1999 by Wilshire Associates that provides a look back to almost 200 years of average historical returns on three asset classes and inflation. The returns are broken down into three different economic periods of American history:

	III **Post-Industrial** Ibbotson + Sinquefield 1926-1999	II **Industrial** Clowes + Siegel 1871-1925	I **Emerging** Schwert + Siegel 1802-1870	**Combined Studies** 1802-1999
Total Returns:				
Stocks	11.3%	7.2%	7.1%	8.6%
Bonds	5.6	4.3	4.9	5.0
T-bills	3.9	3.8	5.2	4.3
Inflation	3.1	0.6	0.1	1.2
Real Returns:				
Stocks	8.2	6.6	7.0	7.4
Bonds	2.5	3.7	4.8	3.8
T-bills	0.8	3.2	5.1	3.1
Stocks minus Bonds	5.7	2.9	2.2	3.6

Source: Wilshire Associates

The table shows that the real rate of return of stocks remained relatively stable over all time periods averaging 7.4 percent. Real returns on bonds and cash varied during the three periods and the relationship between each other and stocks is quite varied.

Discussion:

After looking at the historical returns, most consultants then adjust their numbers to reflect the current starting point of today's financial market, most also take it a step further by developing some forecast of future economic trends. The inclusion of these predicted trends injects the consultant's personality and perspective. These subtle changes drive almost all of the difference between assumptions of the firms. For added comparison, staff accumulated the capital market assumptions of 21 State pension plan peers. These helped frame and collaborate the final recommendations. The results of the Consultants and State peers return assumptions are listed in **Attachment 2**.

To assist the Committee, staff has taken the information from each firm and developed a recommended set of assumptions. While they differ slightly from firm-to-firm, they are close to the average and well within the range of the firms. Clearly neither the consultants nor staff has the "magic" numbers. Developing these assumptions is a cooperative effort and given their critical importance to the asset allocation model and the stochastic model, the Committee's input is crucial.

To aid the discussion, staff has pulled out a couple of the "hot topics" from the matrix of numbers and correlations. These topics have been debated in the investment press of late. In each case staff compares the consultant's view, the median of 21 State pension peers, and CalSTRS staff's recommendation. The topics are: 1) the total and real return of equities; 2) the equity risk premium; 3) the expected return for real estate.

Overall and real rate of return for US Equities:

	Real	Total
PCA	7.00%	9.50%
Callan Associates	6.40%	9.30%
Mercer Associates	6.20%	8.70%
Median of Peers	6.50%	9.00%
Staff's recommended return	6.75%	9.25%

A popular topic in recent discussion about capital market assumptions has been the overall return or better yet, the lack of a return for equity investments. The table above shows that while expectations might be lower than they were in the late 1990's, our Consultants and peers still assume high single digit returns for US equity investments. Callan uses a series of market statistics to present the case for their equity assumptions in **Attachment 3**.

Equity Risk Premium:

PCA	4.25%
Callan Associates	3.55%
Mercer Associates	4.70%
Median of Peers	3.25%
Staff's recommended spread	3.50%

Another popular debate in the institutional investment press has been the future of the equity risk premia (the equity risk premium if the extra return investors are expected to receive from stocks verses low risk bonds). Robert Arnott of First Quadrant, one of CalSTRS investment managers, has authored several articles and papers forecasting a zero permia in the coming years. This view implies that equity investments will not earn any higher return than fixed income investments. As noted in the Wilshire chart above, the historic average for the U.S. has been 3.60%, with the most recent 70 years averaging close to 6% and the 1990's averaging 13.5%. The argument follows that due to very high equity premium received in the 1990's, history will seek its revenge and the return will be close to zero to revert back to toward the long-term historical average. As noted above in our survey, neither the consultants, nor our peers seem to buy into Mr. Arnott's theory.

PCA's report, presented, in our fall 2001 asset allocation study, provided an excellent review of the historical trends in equity risk premiums, this study is labeled **Attachment 4**. PCA concluded that the equity premium has been very cyclical with periods of a high and then low premium. What the next 10 years will hold cannot be interpolated based upon past history. It is interesting to note that all three consultants have raised their expected equity premium for our prior study in the fall of 2001.

Mercer Consulting surveyed nine of the academic and industry thought leaders for their views. The details on their equity risk premium estimates are enclosed and labeled **Attachment 5**. Keep in mind that the time frame used in these forecasts is significantly shorter than those used by CalSTRS for our capital market assumptions. Ratcheting down our equity risk premium to one percent or lower would mean that not a single CalSTRS asset class would earn the 8 percent assumed rate. In fact, Mr. Arnott's work leads one to invest in timber, commodities, and hedge funds just to approach an 8 percent return. This is such a radical idea, that not a single institutional investor endorses this concept.

Expected Return for Real Estate:

	Return
PCA	7.50%
Callan Associates	8.00%
Mercer Associates	8.70%
Median of Peers	7.75%
Staff's recommended return	7.50%

Each consultant incorporates a different mix of private and public real estate securities. All three of the consultants have lowered their expected return from last year. Fortunately, CalSTRS has a long history in real estate investments that can help serve as a guide for future returns. Over the past ten years CalSTRS has earned 7.10 percent from real estate investments through both down and up markets. Going forward, the current portfolio has an 80 percent weighting in core real estate with an estimated net cash flow return of 7.5 percent.

Recommendation:

The Chief Investment Officer and Pension Consulting Alliance recommend that CalSTRS lower the expected returns for each asset class by 50 basis points. The complete risk, return and correlation recommendations are listed on the following page. If approved by the Investment Committee, Milliman U.S.A. will use these new capital market assumptions in the stochastic asset liability study. These new numbers will also revise the assumption within the CalSTRS Investment Policy & Management Plan adopted by the Board at the July 2002 meeting.

Prepared and recommended by:

Christopher J. Ailman
Chief Investment Officer

Attachment 1
Investment Committee - Item 8
December 4, 2002

CAPITAL MARKET ASSUMPTION

Listed below are the returns projected by the consultants, the average of the consultants, the CalSTRS's current return assumptions, and staff's recommendation:

	PCA	Callan	Mercer	Peer median	CalSTRS 2001	Staff recommendation
U.S. Equity	9.50	9.30	8.70	9.00	9.75	9.25
Non-U.S. Equity	9.50	9.90	9.00	9.30	9.75	9.25
Fixed Income	5.25	5.75	5.00	5.75	6.25	5.75
TIPS (Inflation Protected Bonds)	5.00	5.40	5.30	5.15	N/A	5.25
Liquidity (Cash)	4.50	3.50	3.50	3.90	5.00	4.50
Real Estate	7.00	8.00	7.90	7.75	8.00	7.50
Private Equity	13.50	12.25	9.90	12.00	13.00	12.50
Inflation	2.50	2.90	2.50	2.50	3.50*	2.50*

*The inflation number used by the CalSTRS System Actuary is 3.50 percent

Listed below are the risks or standard deviation assumption of the consultants, the average of the consultants, the CalSTRS's current return assumptions, and staff's recommendation:

	PCA	Callan	Mercer	CalSTRS 2001	Staff recommendation
U.S. Equity	22.0	17.20	18.6	18.0	22.0
Non-U.S. Equity	22.0	21.5	21.5	22.0	22.0
Fixed Income	8.0	5.0	6.6	7.0	8.0
TIPS (Inflation Protected Bonds)	4.0	6.3	5.5	N/A	5.0
Liquidity (Cash)	1.5	0.7	1.5	1.0	1.5
Real Estate	13.0	16.5	13.5	13.0	13.5
Private Equity	35.0	35.0	33.5	33.0	35.0

* In the past CalSTRS blend the assumption for Private Equity and Real Estate into one category called Private markets

Correlation:

Listed below is the staff recommended correlations.

	US Equity	Non-U.S. Equity	Fixed Income	TIPS	Private Equity	Real Estate
U.S. Equity	1.00					
Non-U.S. Equity	0.70	1.00				
Fixed Income	0.25	0.10	1.00			
TIPS	-0.40	-0.40	0.50	1.00		
Private equity	0.65	0.60	0.10	0.00	1.00	
Real Estate	0.50	0.40	0.50	0.50	0.15	1.00
Liquidity	0.10	0.00	0.40	0.40	0.10	0.30

Listed below are the correlations of PCA and Callan for comparison. The highlighted box notes key differences.

Pension Consulting Alliance

	US Equity	Non-U.S. Equity	Fixed Income	TIPS	Private Equity	Real Estate
U.S. Equity	1.00					
Non-U.S. Equity	0.55	1.00				
Fixed Income	0.25	0.00	1.00			
TIPS	-0.40	-0.40	0.60	1.00		
Private equity	0.65	0.60	0.00	0.00	1.00	
Real Estate	0.35	0.00	0.50	0.40	0.10	1.00
Liquidity	0.40	0.00	0.40	0.40	0.00	0.60

Callan Associates

	US Equity	Non-U.S. Equity	Fixed Income	TIPS	Private Equity	Real Estate
U.S. Equity	1.00					
Non-U.S. Equity	0.76	1.00				
Fixed Income	0.28	0.22	1.00			
TIPS	0.01	0.01	0.40	1.00		
Private equity	0.68	0.63	0.25	-0.03	1.00	
Real Estate	0.60	0.50	0.27	0.00	0.42	1.00
Liquidity	-0.12	-0.25	0.30	0.29	0.07	-0.06

Capital Market Assumptions - 2002

Firm	Inflation	US Bonds	US Equity	Non-US Equity	Private Equity	Real Estate	TIPS	Cash
PCA	2.50%	5.25%	9.50%	9.50%	13.50%	7.50%	5.00%	4.50%
Callan	2.90%	5.75%	9.30%	9.90%	12.25%	8.00%		3.50%
Mercer Consulting	2.50%	5.50%	10.20%	10.80%	14.50%	8.70%	5.30%	3.50%
Towers Perrin*	*2.50%**	5.75%	9.80%	10.30%	14.50%	7.90%		3.80%
Wilshire Assoc.*	*2.50%**	5.91%	10.15%	10.64%	15.71%	8.55%		3.77%
Sharpe*	*2.50%**	5.40%	9.90%	8.90%				4.40%
Minnesota	4.50%	8.00%	11.00%	11.25%	14.00%	9.00%		5.50%
Kansas		6.30%	10.00%	10.20%	14.00%	8.00%		5.00%
CalPERS	2.50%	5.50%	9.50%	9.50%	13.50%	8.00%		4.00%
Washington		6.00%	9.50%	9.50%	12.50%	8.50%		
Maryland		6.25%	9.50%	9.50%	12.50%	8.25%		
NYSTRS	2.90%	5.75%	9.30%	9.90%	14.00%	8.00%		3.50%
Hawaii		5.75%	9.30%	9.90%	12.25%	8.00%		3.50%
New Mexico Perm	3.25%	5.75%	9.25%	10.75%	12.00%	7.50%		3.75%
New Jersey		6.75%	9.15%	9.78%				4.75%
Ohio STRS		6.50%	9.00%	9.00%		8.50%		
Florida		6.00%	9.00%	8.50%	15.00%	6.50%		4.50%
Texas PERS		5.60%	9.00%	10.00%				
Wisconsin		5.60%	8.90%	9.30%	11.70%	7.10%		
Missouri School	2.60%	5.50%	8.90%	9.30%	11.80%	7.60%		
Michigan		5.50%	8.75%	8.75%	11.75%	7.25%	5.00%	3.50%
Mass PRIM	2.25%	5.50%	8.75%	8.75%		7.00%	5.00%	
Penn School	2.25%	5.50%	8.75%	8.75%	11.75%	7.25%		3.50%
Kentucky		5.30%	8.70%	8.70%	9.90%	7.90%	5.25%	
South Dakota		6.00%	8.50%	8.50%	12.00%	12.00%	5.70%	
Ohio PERS		4.50%	8.30%	8.30%	11.30%	6.40%		
Louisiana TRS		6.00%	8.30%	9.00%	9.50%			3.00%
Iowa PERS	2.25%	5.25%	8.00%	8.00%	11.00%	7.50%		
Oregon	1.60%	6.00%	7.90%	7.90%	13.10%	7.50%		4.10%

*- Developed using their real rate of return expectations. To balance the comparison, CalSTRS staff used a fixed 2.50% inflation assumption. These Consultants actual forecast may differ.

Peers are ranked by their U.S. equity return in descending order.

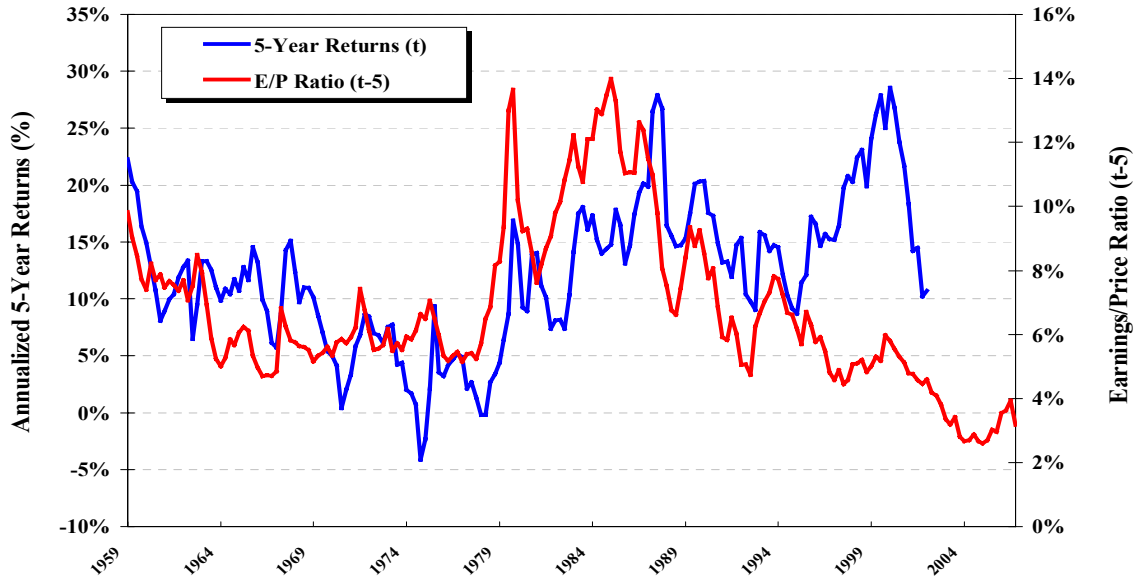
Data developed from a survey of CalSTRS consultants, State pension plans, and the CalPERS 2002 asset allocation study.

Callan's 2002 Capital Market Projections

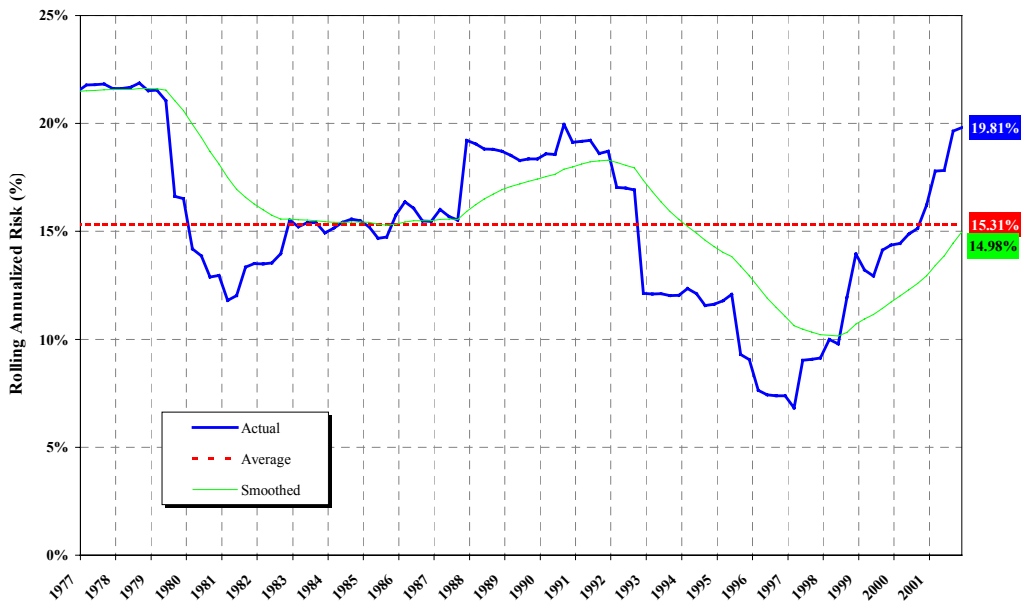
Large Cap Domestic Equity (S&P 500)
Projected Return = 9.00% **Projected Standard Deviation = 16.00%**

- ✓ Callan's 2002 return projection is slightly higher (+10bp) than last year's five-year outlook, reflecting our belief that equity returns will improve as corporate profits expand, however remain low relative to long-run averages.
- ✓ Callan's 2002 risk projection has increased by 1% from last year's projection, reflecting our research that markets indeed have become more risky over time and our belief that there are still some valuation inconsistencies that cannot be justified by fundamentals .
- ✓ The first figure below shows the earnings/price ratio of the S&P 500 versus its five-year annualized return. The E/P ratio is lagged five years to show the relationship between the level of the ratio and future equity returns. While the last two year's market decline helped to bring valuations back toward more reasonable levels, there is still the begging question of whether they will continue to merge.
- ✓ The bottom figure shows the rolling five-year Standard Deviation of returns for the S&P500 and indicates its upward trend since 1994.

S&P 500 5-Year Returns vs. Lagged Earnings/Price (1954 - 2001)



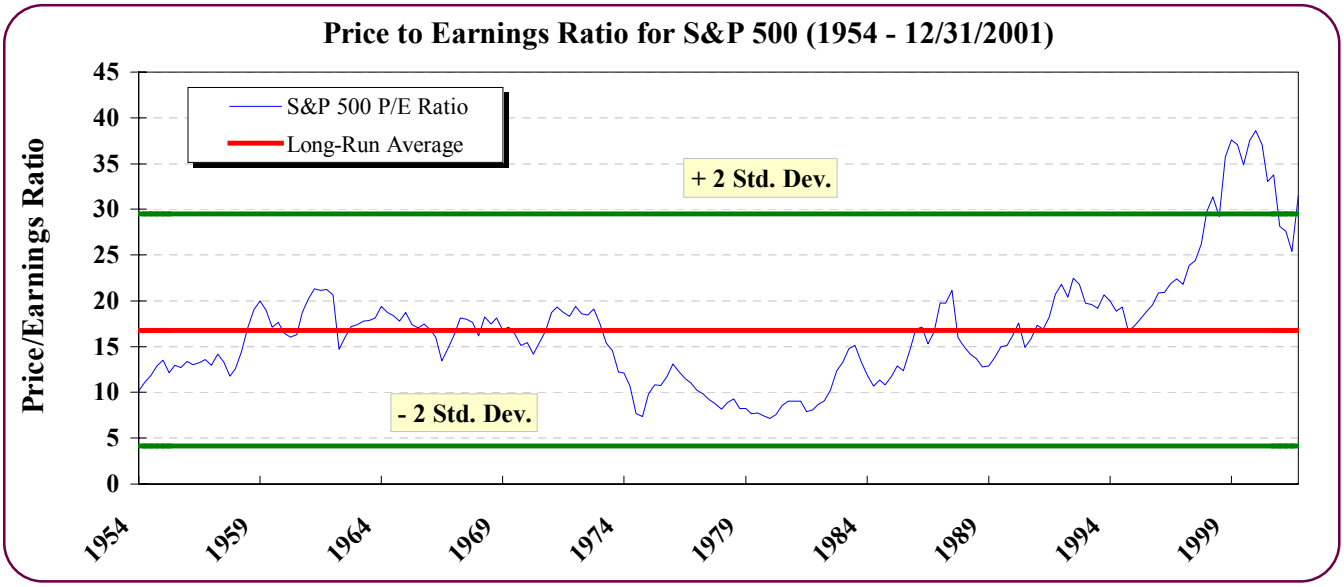
Rolling 5 Year Standard Deviation for S&P 500

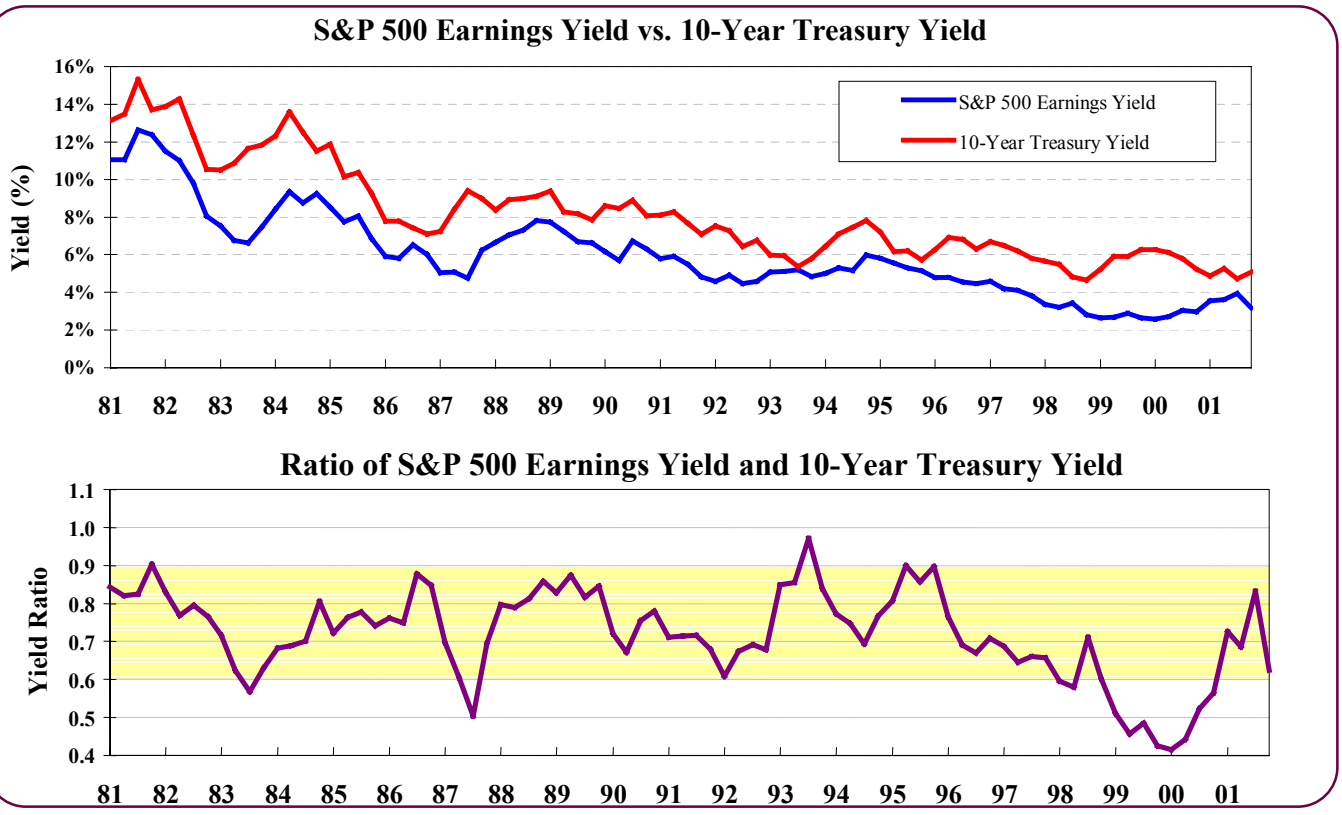


Callan's 2002 Capital Market Projections

Large Cap Domestic Equity (S&P 500)
Projected Return = 9.00% **Projected Standard Deviation = 16.00%**

- ✓ The first figure below shows the P/E ratio of the S&P 500 since 1954, the long-run average and the range of potential values as described by two standard deviation above and below the long-run average. Despite the last 2 years, the current market P/E is still as high as it has ever been. Correspondingly, the E/P ratio is as low as it has ever been.
- ✓ Historically low interest rates are part of the reason for the low E/P (high P/E). Over the course of the 80's and 90's bull market, the ratio of the S&P 500 E/P (often referred to as the "earnings yield") and the 10-Year Treasury Yield have held at a steady range between 0.60 and 0.90 (see bottom figure). As bond yields declined, the E/P of the S&P 500 declined as well. This decline translates directly to the rising P/E ratio. The low current interest rate supports a low E/P (high P/E), but evidence suggests that the high current market valuation is still inconsistent with the long-term interest rate/equity relationship.

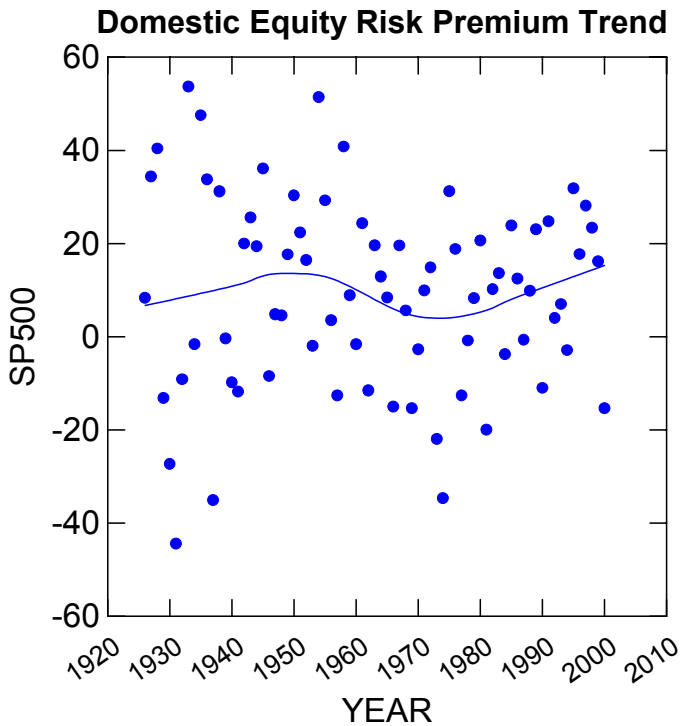




Pension Consulting Alliance

Domestic Equities

History of the Equity Risk Premium



- **The long-term trend of the Equity Risk Premium appears surprisingly cyclical**
- **Trend is at peak: the last comparable observation occurred in the 1950's to 1960's period when inflation was low and the economy was robust**
- **Average over the last 75 years: 9.0%**
- **Average over the last 20 years: 9.6%**
- **Average over the last 10 years: 13.5%**

* -From the October 2001 CalSTRS Asset allocation study

Recent Equity Risk Premium Estimates, June 2002
Louis D. Finney, Mercer Consulting

Provider	ERP Estimate	Basis of Estimate	Comparable Estimate	Comments
Mercer December 2001	3.9%	- Broad market - Geometric return - 10-year Treasury yield	3.9%	This is purely the difference between our all cap equity return (8.9%) and the 10-year Treasury yield on Dec 31, 2001 (5.0%), all rounded to the nearest 0.1%.
Ibbotson Yearbook: 2001	5.7%	- Large Cap - Geometric returns - Long government bond returns	5.9%	The historical experience in the U.S: Historical large cap returns: 11.0% Historical long gov bonds returns: 5.3% We added 0.2% for small cap effect.
Fama and French April 2001	2.55% 4.32%	- Dividends: 2.55% - Earnings: 4.32% - Arithmetic - Commercial paper	0.5% 2.2%	This is not their forecasted number, but I infer it from the tone of what the markets should have earned over the last fifty years.
Ibbotson and Chen June 2001	3.97%	- Geometric - Broad market - Inflation + real rate	4.0%	This study came up with a total return of 9.37% (a second method came up with 9.66%) in early 2001. They used higher inflation (3.08%), but lower real rate (2.05%) and included a reinvestment factor and interaction factor (0.27%)
Bernstein Spring 2001	1.3%	- Geometric - Broad market - 5-yr Treasury Yield	1.3%	This study argues that the dividend rate is the equity risk premium.
Arnott and Ryan Spring 2001	-0.9%	- Geometric - Long TIPS Yield - Broad market	0.3%	Study assumes only a 2.0% growth rate and continued low dividend yield of 1.2%.
Dimson et. al. 2001	3.4%	- T-Bills - Geometric	1.6%	Based on 12 country average.
Singer et. al. July 2001	3.59%	- Risk free rate - Arithmetic	1.9%	They assume a 4.7% risk free rate and a CAPM model.
Barton Biggs, Morgan Stanley April 2002	–	- Dividend 2.0% - Earnings Growth 8.0% - P/E reversion -5.5%	0.3%	Biggs assumes high earnings growth, but a large P/E contraction effect.
Mark Carhart (?), Goldman Sachs June 2002	3.0%	- Real earnings growth 5.0% - Real risk free rate 2.0%	3.0%	Carhart is not worried about P/E contraction. They get an 8.0% expected return for equities.

Attachment 6
Investment Committee – Item 8
December 4, 2002

PROPOSED
RESOLUTION OF THE
TEACHERS' RETIREMENT BOARD
INVESTMENT COMMITTEE

SUBJECT: Capital Market Assumptions Recommendation

Resolution No. _____

WHEREAS, the Investment Committee of the California State Teachers' Retirement Board is responsible for recommendations to the Board, investment policy and overall investment strategy for the management of the Teachers' Retirement Fund, a multi-billion dollar public pension plan, and;

WHEREAS, the Investment Committee has requested a continuous review of its asset allocation, its risk and return correlation and its impact to the system; and

WHEREAS, the investment staff has reviewed the assumption developed by consultant and peers, and based on this, staff, and its consultant, Pension Consulting Alliance, recommend the risk, return and correlation assumption for the Fund. Therefore, be it

RESOLVED; that the Investment Committee officially approve the Capital Market Assumption recommendation, and directs staff to undertake and update the 2002-2003 CalSTRS Investment Policy and Management Plan and provide these assumptions as input to the Milliman U.S.A. stochastic model.

Adopted by:
Investment Committee
on December 4, 2002

_____
Jack Ehnes
Chief Executive Officer